Listing of the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1-26 Cancelled

27. (Previously Presented) An in vivo surgical method of treating a patient, comprising:

inserting an aspiration cannula through the patient's epidermis, the aspiration cannula being provided with a cannula lumen in communication with an open cannula distal end and the aspiration cannula being inserted so that obstructions are not present between the cannula lumen and an area of tissue located distally of the open cannula distal end;

transmitting air and fluid through a fluid and energy guide, the fluid and energy guide longitudinally extending within the cannula lumen;

generating atomized fluid particles in an interaction zone located in close proximity to the open cannula distal end, using the air and fluid transmitted through the fluid and energy guide;

providing electromagnetic energy from an energy source to an electromagnetic energy transmitter operatively mounted within the fluid and energy guide;

transmitting the electromagnetic energy from an output end of the energy transmitter into the interaction zone, the electromagnetic energy having a wavelength which is substantially absorbed by a portion of atomized fluid particles in the interaction zone, the absorption of the electromagnetic energy by the portion of atomized fluid particles causing the portion of atomized fluid particles to expand and impart disruptive cutting forces onto the area of tissue in close proximity to the open cannula distal end

whereby the expanding atomized fluid particles do not contact portions of the aspiration cannula disposed distally of the cannula lumen; and

providing a source of aspiration at a proximal end of the aspiration cannula, wherein the source of aspiration is configured to aspirate air and water from the fluid and energy guide, and tissue debris from within the aspiration cannula, through the open cannula distal end and the aspiration cannula.

28. (Previously Presented) The method according to claim 27, wherein the tissue comprises joint tissue.

29. (Previously Presented) The method according to claim 27, wherein the tissue is located within the head, the eye, the trachea or the abdomen.

30. (Previously Presented) The method according to claim 27, wherein edges of the open cannula distal end are generally rounded or bullet-shaped to facilitate insertion into the patient's tissue with a minimum of localized tissue trauma.

31. (Previously Presented) The method according to claim 27, wherein:

the generating of atomized fluid particles comprises generating atomized water particles;

the providing of electromagnetic energy from an energy source comprises providing laser energy from an erbium, chromium, yttrium, scandium, gallium garnet (Er, Cr:YSGG) solid state laser; and

the absorption of the electromagnetic energy by the portion of atomized water particles causes the portion of atomized water particles to expand and impart disruptive cutting forces onto the area of tissue in close proximity to the open cannula distal end.

32. (Previously Presented) The method according to claim 27, wherein:

the generating of atomized fluid particles comprises generating atomized water particles;

the providing of electromagnetic energy from an energy source comprises providing laser energy from a CO2 laser; and

the absorption of the electromagnetic energy by the portion of atomized water particles causes the portion of atomized water particles to expand and impart disruptive cutting forces onto the area of tissue in close proximity to the open cannula distal end.

33. (Previously Presented) The method according to claim 27, wherein the fluid comprises water.

34. (Previously Presented) The method according to claim 27, wherein the fluid comprises an anesthetic.

35. (Previously Presented) The method according to claim 27, wherein the fluid comprises a saline solution.

36. (Previously Presented) The method according to claim 27, wherein the fluid comprises sterile fluid.

37. (Previously Presented) The method according to claim 27, wherein the fluid comprises epinephrine.

38. (Previously Presented) A tissue remover, comprising:

an aspiration cannula having a cannula proximal end and an unobstructed, open cannula distal end, the aspiration cannula being provided with a cannula lumen in communication with the open cannula distal end, the open cannula distal end being adapted to receive soft or hard tissue therein and into the cannula lumen;

a fluid and energy guide disposed within the aspiration cannula and longitudinally extending within the cannula lumen, the fluid and energy guide transporting air and fluid to a distal end of the fluid and energy guide and being adapted to generate atomized fluid particles in an interaction zone located in close proximity to the distal end of the fluid

and energy guide near the open cannula distal end, the fluid and energy guide further providing electromagnetic energy from an energy source to an electromagnetic energy transmitter operatively mounted within the fluid and energy guide, the electromagnetic energy having a wavelength which is substantially absorbed by a portion of atomized fluid particles in the interaction zone, the absorption of the electromagnetic energy by the portion of atomized fluid particles causing the portion of atomized fluid particles to expand and impart disruptive cutting forces onto soft or hard tissue within the cannula lumen in close proximity with the open cannula distal end; and

a source of aspiration connected to a proximal end of the aspiration cannula, the source of aspiration being configured to aspirate air and fluid from the fluid and energy guide, and soft or hard tissue from within the aspiration cannula, through the open cannula distal end and the aspiration cannula.

39. (Previously Presented) The tissue remover according to claim 38, wherein the electromagnetic energy source comprises an erbium, chromium, yttrium, scandium, gallium garnet (Er, Cr:YSGG) solid state laser.

40. (Previously Presented) The tissue remover according to claim 38, wherein the electromagnetic energy source comprises a CO2 laser.

41. (Previously Presented) The tissue remover according to claim 38, wherein the aspiration cannula is formed of a medical grade plastic.

42. (Previously Presented) The tissue remover according to claim 38, wherein the aspiration cannula is formed of a stainless steel.

43. (Previously Presented) The tissue remover according to claim 38, wherein the electromagnetic energy transmitter is a fiber optic delivery system.

44. (Previously Presented) The tissue remover according to claim 38, wherein the fluid comprises water.

45. (Previously Presented) The tissue remover according to claim 38, wherein the fluid comprises an anesthetic.

46. (Previously Presented) The tissue remover according to claim 38, wherein the fluid comprises a saline solution.

47. (Previously Presented) The tissue remover according to claim 38, wherein the fluid comprises sterile fluid.

48. (Previously Presented) The tissue remover according to claim 38, wherein the fluid comprises epinephrine.

49. (Previously Presented) The method according to claim 27, wherein the tissue comprises soft tissue, cartilage or bone.

50. (Previously Presented) The method according to claim 27, wherein:

the generating of atomized fluid particles comprises generating atomized water particles;

the providing of electromagnetic energy from an energy source comprises providing laser energy from an Er:YAG laser; and

the absorption of the electromagnetic energy by the portion of atomized water particles causes the portion of atomized water particles to expand and impart disruptive cutting forces onto the area of tissue in close proximity to the open cannula distal end.

51. (Previously Presented) The method according to claim 27, wherein the fluid comprises epinephrine and an anesthetic.

52. (Previously Presented) The tissue remover according to claim 38, wherein the energy source comprises an ER:YAG ~~laser~~laser.

53. (Previously Presented) The tissue remover according to claim 38, wherein the fluid comprises epinephrine and an anesthetic.

54. (Previously Presented) A tissue remover, comprising:

a tissue remover cannula having a cannula proximal end and a cannula distal end, the tissue remover cannula being provided with a cannula lumen in communication with the cannula distal end, whereby the cannula distal end is not obstructed and is adapted to receive soft or hard tissue therethrough and into the cannula lumen;

an imager, the imager being adapted to provide an image to a user of an area in proximity to the cannula distal end;

a fluid and energy guide disposed within the tissue remover cannula, the fluid and energy guide transporting air and fluid to a distal end of the fluid and energy guide and being adapted to generate fluid particles in an interaction zone located in close proximity to the distal end of the fluid and energy guide near the cannula distal end, the fluid and energy guide further providing electromagnetic energy from an energy source to an electromagnetic energy transmitter within the fluid and energy guide, the electromagnetic energy having a wavelength which is substantially absorbed by a portion of fluid particles in the interaction zone, the absorption of the electromagnetic energy by the portion of fluid particles causing the portion of fluid particles to expand and impart disruptive cutting forces onto soft or hard tissue within the cannula lumen in close proximity with the cannula distal end; and

a source of aspiration connected to a proximal end of the tissue remover cannula, the source of aspiration being configured to aspirate air and fluid from the fluid and energy guide, and tissue debris from within the tissue remover cannula, through the cannula distal end and the tissue remover cannula.

55. (Previously Presented) The tissue remover as set forth in Claim 54, wherein the energy source comprises an Er, Cr:YSGG laser.

56. (Previously Presented) The tissue remover as set forth in Claim 54, wherein the energy source comprises an infrared laser and the imager comprises an infrared imager.

57. (Previously Presented) The tissue remover as set forth in Claim 54, wherein the imager is disposed within the tissue remover.

58. (Previously Presented) The tissue remover as set forth in Claim 54, wherein the imager is disposed within the cannula lumen.

59. (Previously Presented) The tissue remover as set forth in Claim 56, wherein the imager maps temperature differences of tissue in close proximity with the cannula distal end by detecting electromagnetic radiation from tissue that is at different temperatures from its surroundings.

60.(Previously Presented) The method according to claim 36, wherein the sterile fluid comprises water.

61. (Previously Presented) The method according to claim 36, wherein the sterile fluid comprises an anesthetic.

62. (Previously Presented) The method according to claim 36, wherein the sterile fluid comprises a saline solution.

63. (Previously Presented) The method according to claim 36, wherein the sterile fluid comprises epinephrine.

64. (Previously Presented) The method according to claim 63, wherein the sterile fluid further comprises an anesthetic.

65. (Previously Presented) The tissue remover according to claim 47, wherein the sterile fluid comprises water.

66. (Previously Presented) The tissue remover according to claim 47, wherein the sterile fluid comprises an anesthetic.

67. (Previously Presented) The tissue remover according to claim 47, wherein the sterile fluid comprises a saline solution.

68. (Previously Presented) The tissue remover according to claim 47, wherein the sterile fluid comprises epinephrine.

69. (Previously Presented) The tissue remover according to claim 47, wherein the sterile fluid further comprises an anesthetic.

70. (Previously Presented) An in vivo surgical method of treating a patient, comprising:

inserting an aspiration cannula through the patient's epidermis, so that a tissue aspiration inlet port of the cannula is positioned in close proximity to an area of tissue, the aspiration cannula being provided with a cannula lumen in communication with the tissue aspiration inlet

port whereby soft or hard tissue is drawn into the cannula lumen through the tissue aspiration inlet port;

transmitting air and fluid through a fluid and energy guide, the fluid and energy guide longitudinally extending within the cannula lumen;

generating atomized fluid particles in an interaction zone located in close proximity to the tissue aspiration inlet port, using the air and fluid transmitted through the fluid and energy guide;

providing electromagnetic energy from an energy source to an electromagnetic energy transmitter operatively mounted within the fluid and energy guide;

transmitting the electromagnetic energy from an output end of the energy transmitter into the interaction zone, the electromagnetic energy having a wavelength which is substantially absorbed by a portion of atomized fluid particles in the interaction zone, the absorption of the electromagnetic energy by the portion of atomized fluid particles causing the portion of atomized fluid particles to expand and impart disruptive cutting forces onto the area of tissue within the cannula lumen in close proximity to the tissue aspiration inlet port; and

providing a source of aspiration at a proximal end of the aspiration cannula, wherein the source of aspiration is configured to aspirate air and water from the fluid and energy guide, and tissue debris from within the aspiration cannula.

71. (Previously Presented) A tissue remover, comprising:

an aspiration cannula having a cannula proximal end and a tissue aspiration inlet port, the aspiration cannula being provided with a cannula lumen in communication with the tissue aspiration inlet port, the tissue remover being constructed to draw soft or hard tissue through the tissue aspiration inlet port and into the cannula lumen;

a fluid and energy guide disposed within the aspiration cannula and longitudinally extending within the cannula lumen, the fluid and energy guide transporting air and fluid to a distal end of the fluid and energy guide and being adapted to generate atomized fluid particles in an interaction zone located in close proximity to the distal end of the fluid and energy guide near the tissue aspiration inlet port, the fluid and energy guide further providing electromagnetic energy from an energy source to an electromagnetic energy transmitter operatively mounted within the fluid and energy guide, the electromagnetic energy having a wavelength which is

substantially absorbed by a portion of atomized fluid particles in the interaction zone, the absorption of the electromagnetic energy by the portion of atomized fluid particles causing the portion of atomized fluid particles to expand and impart disruptive cutting forces onto soft or hard tissue within the cannula lumen in close proximity with the tissue aspiration inlet port; and

a source of aspiration connected to a proximal end of the aspiration cannula, the source of aspiration being configured to aspirate air and fluid from the fluid and energy guide, and soft or hard tissue from within the aspiration cannula, through the tissue aspiration inlet port and the aspiration cannula.

72. (Previously Presented) A tissue remover, comprising:

a tissue remover cannula having a cannula proximal end and a tissue aspiration inlet port, the tissue remover cannula being provided with a cannula lumen in communication with the tissue aspiration inlet port, the tissue remover being constructed to draw soft or hard tissue through the tissue aspiration inlet port and into the cannula lumen;

an imager, the imager being adapted to provide an image to a user of an area in proximity to the tissue aspiration inlet port;

a fluid and energy guide disposed within the tissue remover cannula, the fluid and energy guide transporting air and fluid to a distal end of the fluid and energy guide and being adapted to generate fluid particles in an interaction zone located ~~in close proximity to~~ distally of the distal end of the fluid and energy guide near the tissue aspiration inlet port, the fluid and energy guide further providing electromagnetic energy from an energy source to an electromagnetic energy transmitter within the fluid and energy guide, the tissue remove being constructed to transmit the electromagnetic energy beyond the distal end and into a portion of fluid particles in the interaction zone and the electromagnetic energy having a wavelength which is substantially absorbed by ~~a~~ the portion of fluid particles in the interaction zone, the absorption of the electromagnetic energy by the portion of fluid particles causing the portion of fluid particles to expand and impart disruptive cutting forces onto soft or hard tissue in close proximity with the tissue aspiration inlet port; and

a source of aspiration connected to a proximal end of the tissue remover cannula, the source of aspiration being configured to aspirate air and fluid from the fluid and energy guide,

and tissue debris from within the tissue remover cannula, through the tissue aspiration inlet port and the tissue remover cannula.

73. (Previously Presented) An in vivo surgical method of treating a patient, comprising:

inserting an aspiration cannula through the patient's epidermis, so that a cannula distal end of the aspiration cannula is positioned in close proximity to an area of tissue, the aspiration cannula being provided with a cannula lumen in communication with the cannula distal end;

transmitting air and fluid through a fluid and energy guide, the fluid and energy guide longitudinally extending within the cannula lumen;

generating atomized fluid particles in an interaction zone located ~~outside~~ distally of the cannula distal end, using the air and fluid transmitted through the fluid and energy guide;

providing electromagnetic energy from an energy source to an electromagnetic energy transmitter operatively mounted within the fluid and energy guide;

transmitting the electromagnetic energy from an output end of the energy transmitter out of the cannula distal end and into the interaction zone, the electromagnetic energy having a wavelength which is substantially absorbed by a portion of atomized fluid particles in the interaction zone, the absorption of the electromagnetic energy by the portion of atomized fluid particles causing the portion of atomized fluid particles to expand and impart disruptive cutting forces onto the area of tissue outside of the cannula distal end; and

providing a source of aspiration at a proximal end of the aspiration cannula, wherein the source of aspiration is configured to aspirate air and water from the fluid and energy guide, and tissue debris from within the aspiration cannula, through the cannula distal end and the aspiration cannula.

74. (Previously Presented) A tissue remover, comprising:

an aspiration cannula having a cannula proximal end and a cannula distal end, the aspiration cannula being provided with a cannula lumen in communication with the cannula distal end, the cannula distal end being constructed to be placed into close proximity to soft or hard tissue;

a fluid and energy guide disposed within the aspiration cannula and longitudinally extending within the cannula lumen, the fluid and energy guide transporting air and fluid to a distal end of the fluid and energy guide and being adapted to generate atomized fluid particles in an interaction zone located ~~outside~~ distally of the cannula distal end, the fluid and energy guide further providing electromagnetic energy from an energy source to an electromagnetic energy transmitter operatively mounted within the fluid and energy guide, the electromagnetic energy exiting the fluid and energy guide at a point outside of the cannula distal end and having a wavelength which is substantially absorbed by a portion of atomized fluid particles in the interaction zone, the absorption of the electromagnetic energy by the portion of atomized fluid particles causing the portion of atomized fluid particles to expand and impart disruptive cutting forces onto soft or hard tissue in close proximity with the interaction zone; and

a source of aspiration connected to a proximal end of the aspiration cannula, the source of aspiration being configured to aspirate air and fluid from the fluid and energy guide, and soft or hard tissue from within the aspiration cannula, through the cannula distal end and the aspiration cannula.

75. (Previously Presented) A tissue remover, comprising:

a tissue remover cannula having a cannula proximal end and a cannula distal end, the tissue remover cannula being provided with a cannula lumen in communication with the cannula distal end, the tissue remover being constructed to receive soft or hard tissue therein and into the cannula lumen;

an imager, the imager being adapted to provide an image to a user of an area in proximity to the cannula distal end;

a fluid and energy guide disposed within the tissue remover cannula, the fluid and energy guide transporting air and fluid to a distal end of the fluid and energy guide and being adapted to generate fluid particles in an interaction zone located distally ~~outside of~~ the cannula distal end, the fluid and energy guide further providing electromagnetic energy from an energy source to an electromagnetic energy transmitter within the fluid and energy guide, the electromagnetic energy exiting the fluid and energy guide at a point outside of the cannula distal end and having a wavelength which is substantially absorbed by a portion of fluid particles in the interaction zone,

the absorption of the electromagnetic energy by the portion of fluid particles causing the portion of fluid particles distal of the distal cannula end to expand and impart disruptive cutting forces onto soft or hard tissue in close proximity with the interaction zone; and

a source of aspiration connected to a proximal end of the tissue remover cannula, the source of aspiration being configured to aspirate air and fluid from the fluid and energy guide, and tissue debris from within the tissue remover cannula, through the cannula distal end and the tissue remover cannula.